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THE TREATMENT OF HAY FEVER.

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Hygienic Measures.

Hygienic measures are as important in the control of hay fever as they are in the case of typhoid fever, malaria, yellow fever, and other preventable diseases. By living in a weed-infected neighborhood a patient greatly increases the difficulties of his immunization and frequently necessitates the raising of his immunity to 85 per cent when ordinarily 70 per cent would be sufficient. In all cases treated at the Hay Fever Clinic at the Charity Hospital, patients are given charts of nine blocks of their neighborhood, with instructions to locate thereon lots that are infested with weeds. When this has been done, the charts are sent to the city board of health, which notifies the owners of the lots to cut the weeds under penalty of prosecution for violating the grass-weeds ordinance.

In order to demonstrate the efficiency of such measures, the American Hay-Fever-Prevention Association in 1916 employed special inspectors to cooperate with the regular force of the New Orleans Board of Health, with the result that the number of spring hay-fever cases of that year was reduced to less than 50 per cent. As the fall hay fever in Louisiana is due to the ragweeds, *Ambrosias*, whose potential radius¹ is ten times greater than that of the grasses which cause the spring hay fever, the benefit in the fall cases was much less marked, as the pollen blew in from the surrounding country.

In the selection of homes, hay-fever subjects should choose localities distant from weed-infested areas. The pollen of the grasses, and of the summer hay-fever weeds generally, does not ordinarily travel very far, and a mile is usually a safe distance. The pollen of the ragweeds and other fall hay-fever weeds, however, is very buoyant, and in windy weather may travel 3 to 5 miles.

During their attacks of hay fever patients should avoid localities infested with weeds generally, and especially with those weeds to whose pollen they are sensitive. Should their neighborhood be infected with weeds, and a grass-weeds ordinance be in force, this

¹ Hay fever and Hay fever Pollens. W. Schepppegrell, M. D. Archives of Internal Medicine, June, 1917.

condition should, in the interest of public health, be reported to the board of health.

During the hay-fever season patients should avoid driving or riding into suburbs abounding in weeds. An attack resulting from this increased exposure may lower their resistance and make them more susceptible to the pollen of their own neighborhood.

A reasonable amount of exercise is beneficial; but this should be taken without increased exposure to the hay-fever pollens. Swimming, especially in salt water, is an excellent form of exercise.

Considerable literature is published each year in the lay press regarding the benefit of the "cold storage" treatment of hay fever. As practically all ventilation is excluded in this treatment, there is an absence of atmospheric pollen, which is the principal cause of the relief which the patients experience. The low temperature, however, instead of being a benefit, is really a source of danger, as we have had several cases of bronchitis which resulted from such exposure. In any event, the relief is only transient and can be as well obtained in any room from which the pollen-laden air is excluded.

Effects of Rain.

It is well known that a continued rain affords relief to hay-fever patients. The action of the rain is to cause precipitation of the pollen floating in the air and to prevent more pollen from leaving the plant during the continuation of the rain. If this condition continues long enough the effects of the inhaled pollen pass off, and the patient has relief until the rain is over and a wind of sufficient velocity again fills the air with the hay-fever pollen.

It has been supposed that the pollen which is precipitated by the rain may again be carried into the air and continue its irritating effect. This, however, is not the case. The principal varieties of pollen have been tested in our biological laboratory and it has been found that the submersion of the pollen in a large amount of water removes its toxic properties. After the pollen has been exposed in this way, it has been tested in large numbers in the nostrils of hay-fever subjects without producing any apparent effect. Several hundred pollen were frequently inhaled without effect by hay-fever subjects who ordinarily react to a small number of fresh pollen.

Screening, Masks, and Inhalers.

The result of this investigation is of practical value in certain cases of hay fever. When a hay-fever subject has been operated on or is seriously ill from other causes so that the irritation of sneezing and other symptoms of hay fever would not only be annoying but even dangerous, the patient may be protected by having the windows of his room screened with thin cloth saturated with water. All pollen

coming in contact with the moist cloth would not only be arrested but robbed of its toxicity.¹

When this method of screening is not practicable, a special inhaling mask, based on the same principle and serving the same purpose, may be arranged for the patient.

There are on the market a number of widely advertised inhalers for the prevention of hay fever. The device is inserted into the nostrils, and a fine gauze is supposed to filter the inhaled air free from hay-fever pollens. Aside from the question as to whether a mesh with openings of 0.05 cm. prevents the entrance of pollens 0.0015 cm. in diameter, we were unable to find a patient who did not prefer the hay fever to the discomfort of wearing the inhaler.

Diet.

The diet of hay-fever subjects during the hay-fever season should be light as regards food rich in protein, such as meat, fish, eggs, cheese, and milk. Farinaceous food may be taken in moderation. Vegetables are of benefit, as is fruit also.

High seasoning should especially be avoided, as it frequently reacts on the membranes of the nostrils already irritated by the pollen. Alcoholic drinks are injurious.

In cases complicated by asthma, the rules regarding diet should be carefully observed, and it is preferable in these cases to have the principal meal during the middle of the day.

There are certain articles of food that should be avoided in special cases; but these vary within such wide limits that no specific rules can be formulated. In one case, for instance, an attack of hay fever could be aggravated by a piece of watermelon; in another by peaches. Mustard and pepper should be avoided, and occasionally, also, tea and coffee.

Surgical Methods.

While abnormal nasal conditions in their relationship to hay fever have been given undue importance by some rhinologists, they should, nevertheless, be given careful consideration as forming a predisposing factor in hay fever. In fact, any condition which tends to develop a hypersensitiveness of the nasal mucosa predisposes the patient to an incipient sensitization which tends to result in a persistent form of hay fever.

Marked septal spurs, ridges, or deflections, which cause a concentration of pollen in the obstructed nostril, or which touch the opposite turbinal and thus cause irritation, congestion, and hypersensitiveness, may form an important predisposing cause. Infection of

¹ "Toxicity" here refers to the positive reaction in hay-fever subjects. The existence of a true toxin in these pollens is still under investigation.

the sinuses, especially of the ethmoidal cells, should receive careful attention.

While the percentage of cures from operations on these cases is not high (10 per cent), they should not be overlooked in the prophylaxis of hay fever.

Nasal surgery in hay fever, however, should be avoided except in such conditions as indicated above. In other cases operations are unnecessary inflictions on the patient and are without benefit. One of our patients, a physician, had both inferior turbinals cauterized and then removed and the right ethmoidal cells eviscerated without benefit, and the surgeon had advised a similar operation on the left side. Another patient had nine operations performed, including several electrocauterizations, without perceptible benefit to his hay fever. These cases indicate not only the futility of excessive surgery, but also the distressing character of a disease that would make the patient submit to these repeated ordeals.

In hay fever the electrocautery has probably been used more frequently than any other surgical method. It is based on the idea that in hay fever there is an intumescence of the inferior turbinals which the cicatricial contraction following the cauterization is intended to relieve.

There are few cases, however, that have been benefited by this method, and we have seen many patients who claim that their condition was aggravated by the cauterization. In view of these facts electrocauterization should be avoided in hay fever.

In a series of 707 cases (Series C and D) treated in the hay fever clinic of the Charity Hospital 8 per cent had been operated on for hay fever without apparent benefit.

Constitutional Treatment.

Calcium chloride or, preferably, the less irritating calcium lactate, is occasionally of benefit in hay fever. It should be given after meals in doses of 15 grains, well diluted.

In cases of hyperacidity, sodium bicarbonate in the effervescent form should be administered. The dose is 15 grains, 3 or 4 times daily. In one of our cases a seasonal cure resulted from the administration of 10 grains of quinine 3 times daily; in other cases it was without benefit. It is indicated that in this case malaria was the predisposing cause, which was corrected by the quinine.

In cases associated with asthma sodium iodide may be administered, preferably 10 to 20 drops of a saturated solution, 3 times daily, and well diluted.

Mercury has also been used in hay fever, and Barton L. Wright, of the United States Navy, reports several cases successfully treated. He prefers the succinimide of mercury, $\frac{1}{2}$ grain in distilled water, this

being injected deeply into the gluteal muscles. He believes that the effects are due to the fact that patients after a mercuric treatment have a peculiar power of resistance to infection of every kind.

Local Treatment.

Menthol in the form of an oily spray is of benefit in some cases of hay fever, but aggravates the attack in others. Two grains to the ounce of liquid petrolatum is the usual proportion. The following formula gives temporary relief, but tends to establish the cocaine habit:

℞ Epinephrin sol. (1-1000),
2 per cent sol. cocaine., $\overline{\text{aa}}$ f. \mathfrak{z} i.
Normal saline solution, $\overline{\text{aa}}$ f. \mathfrak{z} i.
Sig.—Two drops into each nostril as directed.

Solutions of cocaine and of epinephrin tend to develop a turgescence of the nasal mucosa which aggravates the hay fever. They should therefore, be used only to give relief in severe paroxysms.

The epinephrin and cocaine may also be used in the form of an ointment, but this should be prescribed with the same precautions as the solution.

For the conjunctivitis that frequently accompanies hay fever, five per cent argyrol may be used, or the following may be prescribed:

℞ Sodii bboratis,
Acidi borici, aa. gr. xv
Sodii chloridi, gr. iii
Aquae dest, qs. f. \mathfrak{z} i
Sig.—For eyes as directed.
(Dispense in Stearn's container.)

Nasal Massage.

As a means of reducing the hypersensitiveness of the nostrils before the opening of the hay fever season, and for correcting the intumescence of the nasal mucosa which frequently remains after the paroxysms have subsided, we use a form of nasal vibratory massage. For this purpose, a mechanical vibrator is used which we first devised in 1908. (Fig. 3.) It is operated by compressed air under a pressure of 50 to 60 pounds. The air drives the piston forward and backward in the cylinder, and this imparts a vibratory movement to the nasal applicator. The arrangement is such that the operation of the applicator in the nasal cavity can be observed. Cotton is attached to the end of the applicator, and a 4 per cent solution of iodized phenol in glycerin is applied to the cotton.

By means of this instrument, a vibratory massage is applied over the inferior turbinal septum and the lower portion of the middle turbinal. At first the massage is made very lightly and only for a short time, but the action is gradually increased as is also the length

of time of application. The massage is usually applied two or three times weekly.

Vibratory massage is a useful supplementary treatment, and, in a small percentage of cases, has resulted in a cure without other methods. It should be discontinued during the hay fever season, when the mucous membrane is irritated by the atmospheric pollens.

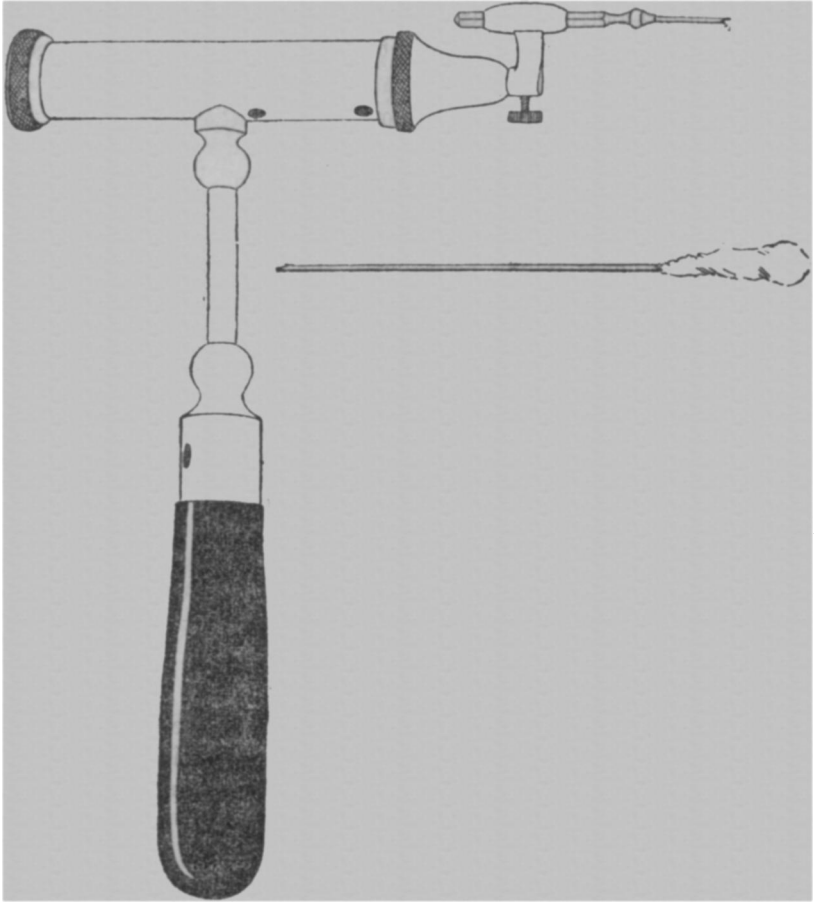


FIG. 3.—Instrument for vibratory massage in hay fever.

Pollen Therapy.

In all cases in which pollen extracts are used, the diagnostic tests should be applied in order to determine the character and degree of the hay fever reaction. This test consists in injecting into (not under) the skin of the forearm five units of the pollen to be tested. These are determined by the pollenometric records, the principal pollens during the spring being from the grasses and, in the eastern, northern, and southern States, from the ragweeds in the fall.

For the convenience of our clinical records, the result of the intradermal tests is recorded on a percentage basis. A marked wheal, two or more centimeters in diameter, is recorded as 100 per cent, 1 centimeter 50 per cent, etc. While this is an arbitrary scale, it is valuable for purposes of comparison, and is much more definite than such terms as "mild," "marked," "severe," etc.

After the character and degree of the sensitization have been determined, the preventive treatment is commenced by injecting five units of the extract of the pollen to which the patient is sensitive and to which he will be exposed. If he is sensitive, for instance, to the grass pollen, which is prevalent in the spring and early summer, this pollen extract is used for the spring treatment.

If the patient is sensitive to both grass and ragweed pollens, the preventive treatment for the grass pollen is commenced six weeks before the grass season opens, and for the ragweed pollen, the same length of time before the commencement of the ragweed season. We do not consider it advisable to use the combined pollens in these cases, on account of the great difference in the seasons of exposure, and the variation in the degree of sensitiveness to these pollens.

The pollen extracts for the preventive treatment are usually injected two or three times weekly and gradually increased to 100 to 200 units. Large doses are not given because our injections of medium doses have given better results, and also because large doses may produce severe reactions, not only of hay fever and asthma, but also of eczema, urticaria, and angioneurotic edema.

As soon as the specific pollen appears in the atmosphere, as shown by the pollenometric records, the injections should be reduced to 20 to 30 units, as the patient is then exposed to the atmospheric pollens.

Pollen and Vaccine Therapy.

While our experience has shown that pollen therapy is useful in the treatment of hay fever, we found that there were many cases in which this form of treatment alone did not give satisfactory results. With the majority of patients, therefore, this was combined with the vaccine therapy. The selection of the form of treatment varies according to the patient's condition, which is influenced by the number of atmospheric pollens which he is inhaling, and this, in turn, depends upon the season and the velocity of the prevailing wind. During the early part of the season, when the grasses and weeds are beginning to pollinate, and toward its end when pollination is nearly completed, the number of pollens in the air is relatively small and the patient's attacks are light. During the middle of the season, however, the number is greatly increased with corresponding increased suffering of the patient.

The principal cause of the increase in the hay-fever paroxysms is due to atmospheric disturbances during the active pollinating

season. During a light wind, 1 to 6 miles per hour, pollen is carried only short distances; while in high winds, 15 to 25 miles per hour, pollen in large quantities is carried to great distances (5 miles or more), so that the number may reach 300 to 400 pollens per square yard of air. During the prevalence of such winds, all hay-fever patients in the vicinity of, and who are sensitive to these pollens, suffer greatly.

If the patient applies for treatment during a severe period, the pollen extracts are usually ineffective and a vaccine should be used, this being injected at intervals of one or two days until the severity of the attack subsides. The pollen extract is then used, the vaccine injections being resumed if a severe paroxysm develops.

Our reason for using the vaccine during severe paroxysms is that at this time the patient is suffering not only from the effects of the pollen, but also from the great increase in the pathogenic microorganisms resulting from the lowered resistance of the respiratory membranes. The use of vaccine therapy at this stage is, therefore, logical, and has given us satisfactory results. In a few cases (3 per cent of a series of 707 cases) the treatment of the successful ones was limited to vaccine therapy only.

The question of autogenous and stock vaccines has been carefully considered in our cases. The autogenous vaccines are preferable, provided they can be obtained of the proper standard and purity. When there is any doubt regarding this, the stock vaccines of unquestioned reliability should be given the preference.

We use three forms of vaccines, each containing to the cc. 1,000 millions in various proportions of the following microorganisms: B Friedländer, M. Catarrhalis, Pneumococcus, Streptococcus pyogenes, Staphylococcus aureus and albus. As soon as the acute attack has subsided, the extract of the pollen, which has been determined to be responsible for the patient's hay fever, is injected, the dose being 15 to 30 units, which is used at intervals of two or three days.

The exact dose is determined by the reaction in the diagnostic test, careful records of which are kept for each patient. When the reaction has been marked small doses (15 to 20 units) are used, while in other cases this is increased to 20 to 40 units.

Should an acute attack again develop, the bacterial vaccine is substituted for the pollen extract, from one to four injections being made. In many cases, one injection is sufficient to control the symptoms.

In all cases, the treatment is discontinued when the pollenometric records show that the atmospheric pollens responsible for the attack have disappeared. Before this time, however, the treatment is discontinued when the report of the patient indicates the control of the hay fever. In discontinuing the treatments they are at first made at increasingly longer intervals before being stopped entirely.



Fig. 1.—GIANT RAGWEED (*AMBROSIA TRIFIDA*).



Fig. 2.—COMMON RAGWEED (*AMBROSIA ARTEMISIAFOLIA*).

In spite of the large number of injections, there have been no cases of infection nor of anaphylactic shock. Tincture of iodine is applied to the skin before and after each injection, except in the diagnostic test, in which case alcohol is applied first and then iodine after the test has been completed.

No restrictions were made regarding the diet in Series C of 400 cases, except in one case in which the symptoms were aggravated by eating peaches or watermelons. Except in this series, we instruct patients to maintain a diet low in proteins, and to refrain from articles known to cause anaphylactic disturbances, such as fish, crabs, shrimps, strawberries, etc.

Results of Treatment.

From an analysis of the result in Series C and D (707 cases) we find that there were seasonal cures in 49 per cent of the cases and marked improvement in 40, or satisfactory results in 89 per cent of the total number.

In 4 per cent of the cases, there was little or no perceptible improvement, and 7 per cent discontinued the treatment before the results could be noted. In no case was there any aggravation of the hay-fever symptoms from the treatment or other ill effect.

"Seasonal cure" in these cases indicates that there were no more hay-fever symptoms for the remainder of the season. Before the opening of the following hay-fever season, these cases are again given the diagnostic test. If this is positive, the treatment is repeated. In cases of recent origin, one course of treatment is usually sufficient, but in cases of longer standing two or three courses are required. In some of the cases treated during previous seasons there was no apparent improvement, but the patients had relief from the hay-fever symptoms the following season.

The reason for the difference in the effects of pollen injections is not clearly established. Cooke, Flood, and Coca¹ suggest that if the resulting resistance is due to a gradual saturation or neutralization of an antibodylike substance with the active pollen substance, the union of these two bodies is a much less firm one than that in the more susceptible individuals, and that the active pollen substance is discharged from such a combination and eliminated much more quickly in the former than in the latter.

While the average results in these cases are satisfactory, we believe that the number of seasonal cures will be considerably larger when the advantages of the preventive treatment of hay fever are better understood. In the majority of cases in this series, especially in the hay-fever clinic, the treatment was not begun until the hay fever had actually developed, when the use of pollen therapy is not as effective as the preventive treatment.

¹ The Nature of the Process and Mechanism of the Alleviating Effect of Specific Treatment. Cooke, Flood, and Coca. *The Journal of Immunology*, February, 1917.